

## I CLAIM:

1. An anti-microbial sanitary ware comprising:

a substrate; and

an anti-microbial film formed on said substrate  
5 and comprising a protective layer and anti-microbial  
metal particles that are dispersed in said protective  
layer;

wherein said protective layer is made from a  
compound selected from the group consisting of metal  
10 nitrides and metal carbides; and

wherein said anti-microbial metal particles are  
made from a metal selected from the group consisting  
of silver, zinc, and copper.

2. The anti-microbial sanitary ware of Claim 1, wherein  
15 said compound of said protective layer is metal  
nitride.

3. The anti-microbial sanitary ware of Claim 2, wherein  
said compound is selected from the group consisting  
of zirconium nitride, chromium nitride, and titanium  
20 nitride.

4. The anti-microbial sanitary ware of Claim 3, wherein  
said compound is zirconium nitride.

5. The anti-microbial sanitary ware of Claim 4, wherein  
said substrate is made from a material selected from  
25 the group consisting of copper alloy, zinc alloy,  
stainless steel, ceramics, and plastics.

6. The anti-microbial sanitary ware of Claim 5, wherein

said substrate is made from copper alloy.

7. A method for making an anti-microbial sanitary ware, comprising the steps of:

placing a substrate in a sputtering chamber in  
5 a sputter; and

simultaneously sputtering a first metal target  
of a first metal and a second metal target of a second  
metal through closed-field unbalanced magnetron  
sputtering techniques, which form a continuously  
10 closed magnetic field around the substrate, so as to  
react the first metal into a metal compound which is  
subsequently deposited on the substrate to form a  
protective layer, and so as to generate metal particles  
of the second metal that are dispersed in the protective  
15 layer;

wherein the second metal is selected from the  
group consisting of silver, zinc, and copper; and

wherein the metal compound is selected from the  
group consisting of metal nitrides and metal carbides.

20 8. The method of Claim 7, wherein the first metal is  
selected from the group consisting of zirconium,  
chromium, and titanium.

9. The method of Claim 8, wherein the metal compound  
is selected from the group consisting of zirconium  
25 nitride, chromium nitride, and titanium nitride.

10. The method of Claim 9, wherein the substrate is  
made from a material selected from the group consisting

of copper alloy, zinc alloy, stainless steel, ceramics, and plastics.

11. The method of Claim 10, wherein the sputtering for the first metal target is conducted at a voltage ranging from 20-50V, and a current ranging from 3.5-4.5A.

12. The method of Claim 11, wherein the sputtering for the second metal target is conducted at a voltage of less than 20V, and a current ranging from 0.3-0.5A.

13. The method of Claim 12, wherein the sputtering is conducted at a temperature ranging from 80-180 °C.

14. The method of Claim 13, wherein the sputtering is conducted at a pressure ranging from 0.1-20 mTorr.

15. The method of Claim 14, wherein the sputtering time ranges from 3-13 minutes.